

AMENDMENTS TO THE CLAIMS

Please amend claims 5, 8, and 10, such that the status of the claims is as follows:

1. (Previously Presented) A bandgap electrical reference voltage source (104) comprising:

a first electrical current source (PTAT 101) adapted to produce a first current (I4) proportional to a temperature within an operating range of the source; and
a second electrical current source (CPTAT 102) adapted to produce a second current (I5) inversely proportional to the temperature;

characterised in that the first and second current sources are installed in parallel, and in that the voltage source comprises means (R3) of summing the first and second currents producing a reference current in the summation means generating the reference voltage (VREF) at the terminals of the summation means;

wherein the first current source comprises:

first current generation means adapted to produce at least one third current (I1, I2) proportional to the temperature; and

a first current mirror adapted to produce the first current (I4) as a function of the at least one third current (I1, I2); and

wherein the first current generation means comprises:

at least one first operational amplifier (A1) and at least one transistor (M1, M2) adapted to produce the at least one third current;

at least one bias resistance (R1) adapted to adjust the amplitude of the at least one third current; and

at least two bipole transistors (Q1, Q2) coupled together such that the voltages between the base and the emitter of the transistors are related through an equation of the diode junction type dependent on the temperature.

2. (Previously Presented) Electrical voltage source according to claim 1, characterised in that the summing means comprise at least one first electrical resistance (R3) through which at least part of the reference current (I_4+I_5) will pass.

3-4. (Canceled)

5. (Currently Amended) Electrical voltage source according to claim 1, characterised in that the first current generation means comprise:

- an operational amplifier (A1) among the at least one first operational amplifier, with first and second inputs;

- a first field effect transistor (M1) adapted to produce a fourth current (I_1);

- a second field effect transistor (M2) adapted to produce a fifth current (I_2);

- a first bias resistance (R1) adapted to adjust the amplitude of the fifth current; and

- first and second bipole transistors (Q1, Q2) coupled such that the voltages between the base and the emitter of the transistors are connected through a diode junction type equation dependent on the temperature, the collectors and bases of the bipole transistors being connected to a first voltage potential;

- the first [[,]] and second field effect transistors cooperating with a third field effect transistor (M3) to form the first current mirror such that the first current (I_4) is a function of the fourth and fifth currents;

- the drain of the first field effect transistor being connected to the first bipole transistor and the first input of the operational amplifier;

- the drain of the second field effect transistor being connected to the second input of the operational amplifier and to a first terminal of the first bias resistance;

the second terminal of the first bias resistance being connected to the emitter of the second bipole transistor; and
the output from the operational amplifier being connected to each of the gates [[grids]] of the first, second and third field effect transistors.

6. (Canceled)

7. (Previously Presented) A bandgap electrical reference voltage source (104) comprising:

a first electrical current source (PTAT 101) adapted to produce a first current (14) proportional to a temperature within an operating range of the source; and
a second electrical current source (CPTAT 102) adapted to produce a second current (15) inversely proportional to the temperature;
characterised in that the first and second current sources are installed in parallel,
and in that the voltage source comprises means (R3) of summing the first and second currents producing a reference current in the summation means generating the reference voltage (VREF) at the terminals of the summation means;

wherein the second current source comprises:

second current generation means adapted to produce at least one sixth current (I3) inversely proportional to the temperature; and
a second current mirror adapted to produce the second current (I5) as a function of the at least one sixth current; and

wherein the second current generation means comprise:

at least one second operational amplifier (A2) and at least one transistor (M5) adapted to produce the at least one sixth current; and

at least one bias resistance (R2) adapted to adjust the amplitude of the at least one sixth current.

8. (Currently Amended) Electrical voltage source according to claim 7, characterised in that the second current generation means comprise:

- an operational amplifier among the at least one second operational amplifier with first and second inputs;
- a fourth field effect transistor (M5) adapted to produce a seventh current (I3); and
- a second bias resistance (R2) adapted to adjust the amplitude of the seventh current;

the fourth field effect transistor forming the second current mirror with a fifth field effect transistor (M4) such that the second current is a function of the seventh current;

the drain of the fourth field effect transistor being connected to the second input of the operational amplifier and to the first terminal of the second bias resistance;

the second terminal of the second bias resistance being connected to the first voltage potential;

the first input of the operational amplifier being connected to the emitter of the first bipole transistor;

the drain of the first field effect transistor being connected to the first input of the operational amplifier among the at least one second operational amplifier; and

the output from the operational amplifier being connected to each of the gates [[grids]] of the fourth and fifth field effect transistors.

9. (Previously Presented) Voltage source according to claim 8, characterised in that it also comprises:

- a bias source (100) to supply a starter current (ibias) and/or voltage (vbias) to the first and second current sources and to the summation means;

means of starting the first and second current sources and the summation means, the summation means being powered by the starter voltage.

10. (Currently Amended) Voltage source according to claim 9, characterised in that the starter means comprise sixth, seventh and eighth field effect transistors (M6, M7, M8), the gate [[grid]] of each of the transistors being powered by the starter voltage and the source of each of the transistors being powered by a power supply voltage from the voltage source;

the drain of the sixth field effect transistor being connected to the drain of the first field effect transistor;

the drain of the seventh field effect transistor being connected to the drain of the second field effect transistor; and

the drain of the eighth field effect transistor being connected to the drains of the third and fifth field effect transistors.

11. (Previously Presented) Electrical voltage source according to claim 1, characterised in that a variation of the second current as a function of the temperature compensates for a variation of the first current as a function of the temperature, such that the reference current is independent of the temperature.

12. (Previously Presented) Electrical voltage source according to claim 1, characterised in that a variation of the second current as a function of the temperature does not compensate for a variation of the first current as a function of the temperature, such that the reference current does depend on the temperature.

13. (Previously Presented) Electrical voltage source according to claim 12, characterised in that a variation in the reference current is proportional to a variation in the temperature.

14. (Previously Presented) Temperature sensor and/or temperature threshold detector comprising an electrical voltage source (500) according to claim 12, characterised in that the temperature sensor and/or the temperature threshold detector also comprise means (501) of measuring the reference voltage (VTEMP).

15. (Previously Presented) Temperature sensor and/or temperature threshold detector according to claim 14, characterised in that the temperature sensor and/or the temperature threshold detector also comprise:

means of generating a voltage (VREF) independent of the temperature within the operating range; and

means (501) of comparison of the reference voltage and the voltage independent of the temperature.

16. (Previously Presented) Electronic chip comprising a voltage source according to claim 1.

17. (Previously Presented) System comprising a voltage source according to claim 1 and an electronic device powered by the voltage source.

18. (Previously Presented) System according to claim 17, characterised in that the device belongs to the group consisting of:

analogue/digital and/or digital/analogue converters;

microprocessor cards;

radio-telephones;

battery charge regulation circuits;

electronic devices dedicated to vehicles;

temperature sensors;
electrical power supply supervisors;
digital/analogue and/or analogue/digital conversion devices;
reset circuits;
electronic devices dedicated to spacecraft;
electronic devices dedicated to military vehicles; and
audio or audiovisual devices.

19. (Previously Presented) Electrical voltage source according to claim 7, characterised in that a variation of the second current as a function of the temperature compensates for a variation of the first current as a function of the temperature, such that the reference current is independent of the temperature.

20. (Previously Presented) Electrical voltage source according to claim 7, characterised in that a variation of the second current as a function of the temperature does not compensate for a variation of the first current as a function of the temperature, such that the reference current does depend on the temperature.

21. (Previously Presented) Electrical voltage source according to claim 20, characterised in that a variation in the reference current is proportional to a variation in the temperature.

22. (Previously Presented) Temperature sensor and/or temperature threshold detector comprising an electrical voltage source (500) according to claim 20, characterised in that the temperature sensor and/or the temperature threshold detector also comprise means (501) of measuring the reference voltage (VTEMP).

23. (Previously Presented) Temperature sensor and/or temperature threshold detector according to claim

22, characterised in that the temperature sensor and/or the temperature threshold detector also comprise:

means of generating a voltage (VREF) independent of the temperature within the operating range; and

means (501) of comparison of the reference voltage and the voltage independent of the temperature.

24. (Previously Presented) Electronic chip comprising a voltage source according to claim 7.

25. (Previously Presented) System comprising a voltage source according to claim 7 and an electronic device powered by the voltage source.

26. (Previously Presented) System according to claim 25, characterised in that the device belongs to the group consisting of:

- analogue/digital and/or digital/analogue converters;
- microprocessor cards;
- radio-telephones;
- battery charge regulation circuits;
- electronic devices dedicated to vehicles;
- temperature sensors;
- electrical power supply supervisors;
- digital/analogue and/or analogue/digital conversion devices;
- reset circuits;
- electronic devices dedicated to spacecraft;
- electronic devices dedicated to military vehicles; and
- audio or audiovisual devices.